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The long-term post-outburst spin down of low magnetic field magnetar Swift J1822.3-1606

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The magnetar Swift J1822.3-1606 was discovered when it entered an outburst phase in 2011 July. Previous X-ray studies of its post-outburst rotational evolution yielded inconsistent measurements of the spin-inferred magnetic field. However, it was clear that Swift J1822.3-1606 has the second lowest spin-inferred magnetic field of all known magnetars. Here we present the timing behavior and flux relaxation from over two years of Swift, RXTE, and Chandra observations following the outburst. We find that the ambiguity in previous timing solutions was due to enhanced spin down that resembles an exponential recovery following a glitch at the outburst onset. After fitting out the effects of the recovery, we measure a long-term spin-down rate which implies a dipolar magnetic field that is lower than all previous estimates for this source. We also consider the post-outburst flux evolution, and fit it with both empirical and crustal cooling models. We discuss the flux relaxation in the context of both crustal cooling and magnetospheric relaxation models.

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